

REMARKS

Claims 1-9 were originally filed in this application. Claims 1-9 were cancelled without prejudice or disclaimer, and claims 10-34 were previously added. Claims 10, 11, 13, 18, 20, 22, and 27 are currently amended. Claims 35 and 36 are currently added. Support for these amendments and new claims may be found in the specification, claims, and figures as originally filed. Claim 14 is cancelled without prejudice or disclaimer. As a result, claims 10-13 and 15-36 are pending for examination with claims 10, 20, 22, and 27 being independent claims. No new matter has been added.

Rejections Under 35 U.S.C. § 103

Claims 10-13 and 15-34 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Purdy et al., PCT Publication No. WO 01/00307 A2 (hereinafter “Purdy”) in view of Miyashita et al., U.S. Patent No. 6,280,626 B1 (hereinafter “Miyashita”).

Applicant disagrees that claims 10-13 and 15-34 would have been obvious over Purdy in view of Miyashita.

No *prima facie* case of obviousness of independent claims 10, 20, 22, and 27 and dependent claims 11-13, 15-19, 21, 23-26, and 28-34 over Purdy in view of Miyashita can be made. Purdy and Miyashita could not have been validly combined. Further, any alleged combination of Purdy with Miyashita would not have taught each and every limitation of independent claims 10, 20, 22, and 27 and dependent claims 11-13, 15-19, 21, 23-26, and 28-34.

Independent claim 10 is directed to a filtration arrangement. The filtration arrangement comprises an aeration hood. The aeration hood comprises an upper wall and at least one downwardly extending side wall. The at least one side wall at least partially shrouds at least one membrane module vertically positioned within a feed tank. The aeration hood comprises at least one open-ended tube which extends downwardly from the upper wall. Each of the at least one open-ended tubes has at least one of the at least one membrane modules mounted therein. The at least one of the at least one membrane modules is in fluid communication with an interior of the feed tank through a lower end

of the at least one open-ended tube. There is at least one aeration opening in a wall of the at least one open-ended tube. The at least one downwardly extending side wall extends to below the location of the at least one aeration opening in the at least one open-ended tube.

Purdy is directed to a membrane based filtration device. (Purdy at page 1, line 3.) Purdy discloses one embodiment of a filtration device in FIG. 1 and a second embodiment in FIG. 2 and FIG. 3. In the embodiment according to FIG. 1, filtration occurs from the exterior of the membrane module through the membrane, such that the flow of filtrate is from the outside of the module to an inner lumen channel. (Purdy at page 6, lines 27-28 and at page 7, lines 17-18.) In the embodiment according to FIG. 3 (which is an alternate view of FIG. 2), filtration occurs from the interior of the membrane tubes through the membrane such that water permeates from the inside (the lumens) of the tubes through to the exterior of the membrane. (Purdy at page 7, lines 20-22 and page 8, lines 15-17.) In FIG. 1, Purdy discloses an embodiment with a housing 2 and a manifold 11 connected to the interior of the membrane modules. In FIG. 3 Purdy appears to disclose an embodiment with an upper wall (the part with the openings 22) and a housing 21. Neither of these embodiments discloses, teaches, or suggests a filtration arrangement comprising an aeration hood comprising at least one open-ended tube comprising at least one aeration opening in a wall of the at least one open-ended tube, and having at least one membrane module mounted therein, the at least one membrane module in fluid communication with an interior of the feed tank through a lower end of the at least one open-ended tube.

Miyashita is directed to a membrane separator assembly for separating solids from water. The assembly comprises a plurality of membrane filtration elements arranged as vertically oriented sheets 113 affixed to membrane fixing members 114 in a treatment vessel 100. (Miyashita FIG. 2A and Col. 4, lines 15-39.) At least two wall structures 106 are arranged substantially parallel with the membrane modules. (Miyashita at Col. 4, lines 52-54.) A gas diffuser is provided directly below the separating membranes. (Miyashita FIG. 2A and Col. 4, lines 40-41.) Miyashita nowhere discloses, teaches, or suggests a filtration arrangement comprising an aeration hood

comprising at least one open-ended tube comprising at least one aeration opening in a wall of the at least one open-ended tube.

There is no *prima facie* case of obviousness of independent claim 10 over Purdy in view of Miyashita because the references could not have been validly combined. This is because one of ordinary skill in the art would not have been motivated to combine Purdy with Miyashita in the manner suggested. The Examiner states that the motivation to combine Purdy with Miyashita would be to enclose the multiple Purdy open-ended tubes within the aeration hood sidewalls as taught by Miyashita because such a modification would serve to guide the gas provided by the gas diffuser to the surfaces of the separating membranes. However, the tubes of Purdy are already surrounded by housing 2 and surrounding the tubes with an additional housing, such as sidewalls 206 of Miyashita would serve no purpose. Surrounding the tubes of Purdy with an additional housing would not provide further advantages because housing 2 already serves to guide gas provided by diffuser 4. One of ordinary skill in the art would have realized that to provide an additional housing about housing 2 would not serve to further guide gas toward membrane modules in housing 4 because aeration bubbles are introduced only internal to housing 4 and are retained about the membrane modules by housing 2. Thus, one of ordinary skill of the art would not have been motivated to combine Purdy with Miyashita in the manner suggested because the addition of an additional housing would only increase the size, footprint, and complexity of the filtration system according to Purdy but provide no benefits.

Further, no alleged combination of Purdy with the disclosure of Miyashita would have resulted in the filtration arrangement as claimed in independent claim 10 because it would not have included each and every recited claim limitation.

Neither housing 2 in Purdy FIG. 1 nor housing 21 in Purdy FIG. 3 are open-ended tubes comprising an aeration opening in a wall of the at least one open-ended tube and having at least one membrane module mounted therein, the at least one membrane module in fluid communication with an interior of the feed tank through a lower end of the at least one open-ended tube, as recited in independent claim 10. Housing 2 is blocked off by diffuser 4 proximate to the lower end and thus cannot have at least one membrane module in fluid communication with an interior of the feed tank through a

lower end of the at least one open-ended tube mounted therein as recited in independent claim 10.

Air diffuser 14 of Purdy FIG. 1, which the Examiner asserts is an aeration opening, is located in a lower internal region of housing 2 and does not comprise an aeration opening in a wall of the at least one open-ended tube as recited in independent claim 10. Similarly, bubble diffuser 24 of Purdy FIG. 3 (of which air inlet 15 of Purdy FIG. 2 is a part) is located in a lower internal region of housing 21 and cannot be an aeration opening in a wall of the at least one open-ended tube.

The circular openings shown in Purdy FIG. 3 are not open-ended tubes having at least one of the at least one membrane modules mounted therein as recited in independent claim 10. Rather, the openings illustrated in Purdy FIG. 3 are the open ends of individual membrane filtration fibers (or tubes, as described in Purdy). (Purdy at page 8, lines 9-18.) The openings illustrated in Purdy FIG. 3 are lumens of filtration fibers, not open-ended tubes having membrane modules mounted therein.

Thus, nothing in Purdy could have disclosed, taught, or suggested at least one open-ended tube, each of the at least one open-ended tubes having at least one of the at least one membrane modules mounted therein, the at least one membrane module in fluid communication with an interior of the feed tank through a lower end of the at least one open-ended tube, at least one aeration opening in a wall of the at least one open-ended tube as recited in independent claim 10.

The Examiner concedes in paragraph 6 of the Office Action that Purdy does not teach an assembly of open-ended tubes within the confines of an aeration hood.

Nothing in Miyashita discloses, teaches, or suggests an assembly of open-ended tubes within the confines of an aeration hood either. Thus no combination of Miyashita with Purdy can disclose, teach, or suggest the filtration arrangement as recited in independent claim 10.

Miyashita does not disclose an aeration hood as recited in independent claim 10. This is because the aeration hood as described in the present application is constructed such that gas introduced into the aeration hood may displace liquid from the interior of the hood, which cannot be performed by any structure or arrangement disclosed by Miyashita, as will be explained further below.

Miyashita nowhere discloses an aeration hood comprising at least one open-ended tube extending downwardly from an upper wall, nor any open-ended channel which could be considered similar to such an open-ended tube, as is asserted by the Examiner. With regard to Miyashita's alleged "channels," the only place that the term "channel" even appears in Miyashita is in Col. 6, line 26 where Miyashita describes the dual membrane structure of FIG. 57 as defining a channel between the two membranes 113a and 113b. This "channel" cannot be equated with Applicant's open-ended tubes because this "channel" does not extend downward from any upper wall and cannot have at least one membrane module mounted therein.

Further, as recited in independent claim 10, the at least one open-ended tube comprises at least one aeration opening in a wall of the at least one open-ended tube. No such aeration opening is disclosed in Miyashita. Miyashita discloses openings 207 in side walls 206, but these are not aeration openings in any open-ended tube. These openings are positioned in wall structure 206, which the Examiner alleges is equivalent to Applicant's aeration hood, not in any alleged open-ended tube.

Thus, no *prima facie* case of obviousness of independent claim 10 can be made over Purdy in view of Miyashita. The references can not be validly combined because one of ordinary skill in the art would have had no motivation to combine them. Further, any alleged combination of Purdy with Miyashita would have lacked at least one explicitly recited claim element in independent claim 10.

Accordingly, reconsideration and withdrawal of the rejection of independent claim 10 under 35 U.S.C. § 103 as being unpatentable over Purdy in view of Miyashita is respectfully requested.

Dependent claims 11-13 and 15-19 depend from independent claim 10 and are patentable for at least the same reasons as independent claim 10. Accordingly, reconsideration and withdrawal of the rejection of dependent claims 11-13 and 15-19 under 35 U.S.C. § 103 as being unpatentable over Purdy in view of Miyashita is respectfully requested.

There is no *prima facie* case of obviousness of independent claim 20 over Purdy in view of Miyashita. The Examiner summarily dismisses claims 20 and 21 by alleging

that the inventions of claims 20 and 21 are analogous to that of independent claim 10. Applicant respectfully disagrees that the claimed subject matter of claims 20 and 21 are analogous to the claimed subject matter of independent claim 10. For example, independent claim 20 recites “a sleeve surrounding a periphery of the at least one membrane module, the sleeve extending at least partially along a length of the at least one membrane module, and having an open region adjacent to a lower end of the at least one membrane module” which is claim language not explicitly recited in independent claim 10. Also, independent claim 10 recites “at least one open-ended tube extending downwardly from the upper wall, each of the at least one open-ended tubes having at least one of the at least one membrane modules mounted therein, the at least one of the at least one membrane modules in fluid communication with an interior of the feed tank through a lower end of the at least on open-ended tube” which is claim language not explicitly recited in independent claim 20.

Independent claim 20 is patentable over Purdy in view of Miyashita. As discussed above, Purdy could not have been validly combined with Miyashita. Even if Purdy could have been validly combined with Miyashita, any resulting combination would have failed to disclose, teach, or suggest at least one element of independent claim 20, such as, for example, “a sleeve surrounding a periphery of the at least one membrane module, the sleeve extending at least partially along a length of the at least one membrane module, and having an open region adjacent to a lower end of the at least one membrane module” or “an aeration hood positioned to shroud the at least one membrane module at the location of the open region.” For similar reasons as explained above, the cited references fail to teach or suggest these aspects of the present invention.

Dependent claim 21 depends from independent claim 20 and is patentable for at least the same reasons as independent claim 20.

Accordingly, reconsideration and withdrawal of the rejection of independent claim 20 and dependent claim 21 under 35 U.S.C. § 103 as being unpatentable over Purdy in view of Miyashita is respectfully requested.

No *prima facie* case of obviousness of independent claim 27 over Purdy in view of Miyashita can be made. Independent claim 27 would not have been obvious over

Purdy in view of Miyashita because the references could not have been validly combined. A person of ordinary skill in the art would not have been motivated to modify or combine Purdy with Miyashita in the manner suggested to arrive at subject matter as presently claimed. Further, even if the references could have been combined, the resulting combination would not have taught each and every limitation of independent claim 27.

Independent claim 27 recites a water treatment system comprising an aeration hood submerged in water to be treated, the aeration hood comprising an upper wall with an opening, a tube at least partially submerged in the water to be treated, the tube having a first open end sealingly secured to the upper wall at the opening, and a membrane module disposed within the tube, the membrane module in fluid communication with the water to be treated through the opening in the upper wall.

In the membrane based filtration device according to Purdy, as disclosed in FIG. 3, filtration occurs from the interior of the membrane tubes through the membrane such that water permeates from the inside (the lumens) of the tubes through to the exterior of the tubes. (Purdy at page 7, lines 20-22 and page 8, lines 15-17.) Miyashita, in contrast, discloses filtration membranes where filtration occurs from the exterior of a membranes through to the inside (the lumens) of the membranes. (Miyashita at Col. 9, lines 10-32.) One of ordinary skill in the art would not have been motivated to combine the disclosure of Miyashita with Purdy in the manner suggested because the disclosures of Miyashita and Purdy have different, mutually exclusive principles of operation. The flow of the filtrates during filtration is in opposite directions in the two embodiments. There would have been no motivation for one of ordinary skill in the art to combine these embodiments because the two embodiments teach away from one another. Hence, Miyashita could not have been validly combined with Purdy.

As discussed above, the openings shown in Purdy FIG. 3 are not tubes having a membrane module disposed within the tube as recited in independent claim 27. Rather, the openings illustrated in Purdy FIG. 3 are the open ends of individual membrane filtration fibers (or tubes, as described in Purdy). (Purdy at page 8, lines 9-18.) The openings illustrated in Purdy FIG. 3 are those of lumens of filtration fibers, not tubes having membrane modules mounted therein.

As discussed above, Miyashita fails to disclose any open-ended tubes, let alone an open-ended tube sealingly secured to an upper wall and enclosing a membrane module. Thus, even if Purdy could have been validly combined with Miyashita, no alleged combination would have disclosed, taught, or suggested a tube having a first open end sealingly secured to an upper wall and a membrane module disposed within the tube as recited in independent claim 27.

Thus, no *prima facie* case of obviousness of independent claim 27 can be made over Purdy in view of Miyashita because the references could not have been validly combined in the manner suggested and because any alleged combination Purdy with Miyashita would have lacked at least one explicitly recited claim element in independent claim 27.

Accordingly, reconsideration and withdrawal of the rejection of independent claim 27 under 35 U.S.C. § 103 as being unpatentable over Purdy in view of Miyashita is respectfully requested.

Dependent claims 28-34 depend directly or indirectly from independent claim 27 and are patentable for at least the same reasons as independent claim 27.

Dependent claims 29-34 are further patentable over Purdy in view of Miyashita for additional reasons. Purdy fails to disclose a gas opening through the side of an open-ended tube. Purdy discloses a gas inlet which feeds into bubble diffuser, however, the bubble diffuser is not a tube with a membrane module disposed therein. Thus, Purdy cannot disclose the water treatment system of dependent claim 29, wherein the tube comprises at least one aeration opening disposed at a tube wall thereof. Nothing in Miyashita discloses, teaches, or suggests a tube comprising at least one aeration opening disposed at a tube wall thereof as recited in dependent claim 29 either, and so no alleged combination of Purdy and Miyashita could have disclosed the water treatment system of dependent claim 29. Dependent claims 30-34 depend directly or indirectly from dependent claim 29 and thus are further patentable over Purdy in view of Miyashita for at least the same reasons as dependent claim 29.

Accordingly, reconsideration and withdrawal of the rejection of dependent claims 28-34 under 35 U.S.C. § 103 as being unpatentable over Purdy in view of Miyashita is respectfully requested.

Independent claim 22 recites a method of cleaning a membrane module disposed in a tank. The method comprises immersing in feed liquid a filtration arrangement comprising an aeration hood shrouding the membrane module, the aeration hood comprising a tube extending downwardly from an upper wall of the aeration hood, the tube at least partially enclosing the membrane module and comprising an aeration opening in a wall of the tube at a location spaced from an upper end thereof, displacing feed liquid within the aeration hood with a gas, and passing the gas through the aeration opening into a volume enclosed by the tube.

As discussed above, Purdy does not disclose, teach, or suggest a filtration arrangement comprising a tube at least partially enclosing a membrane module and comprising an aeration opening in a wall of the tube at a location spaced from an upper end thereof. Miyashita does nothing to address these deficiencies.

Further, Purdy in view of Miyashita does not disclose, teach, or suggest a filtration arrangement comprising an aeration hood from which feed liquid may be displaced by gas introduced into the aeration hood nor one where gas may be passed through an aeration opening in a tube into a volume enclosed by a tube as recited in independent claim 22. Miyashita can not disclose, teach, or suggest an aeration hood from which feed liquid may be displaced with a gas because Miyashita discloses no structure which may retain a gas between sidewalls 106a and 106b. Miyashita suggests that a plate may be provided as a connecting member for walls 106a and 106b and that this plate may extend horizontally between the enclosure wall structures (Miyashita at Col. 4, line 67 – Col. 5, line 1), but states that this plate “should include flow passages therethrough so as to permit liquid to flow through the enclosure wall subassembly in a vertical direction.” (Miyashita at Col. 5, lines 2-4.) Thus, even if this plate were located at the upper end of the enclosure wall structure of Miyashita, it would not allow for liquid to be displaced from within the wall structure by a gas because the plate would “permit liquid to flow through the enclosure wall subassembly in a vertical direction,” and also, presumably, allow gas introduced within the wall subassembly to flow through.

Thus, no *prima facie* case of obviousness of independent claim 22 can be made over Purdy in view of Miyashita for at least similar reasons that no *prima facie* case of obviousness of independent claims 10 and/or 20 and/or 27 can be made based on Purdy

in view of Miyashita. The references could not have been validly combined and any alleged combination Purdy with Miyashita would have lacked at least one explicitly recited claim element in independent claim 22.

Accordingly, reconsideration and withdrawal of the rejection of independent claim 22 under 35 U.S.C. § 103 as being unpatentable over Purdy in view of Miyashita is respectfully requested.

Dependent claims 23-26 depend directly or indirectly from independent claim 22 and are patentable for at least the same reasons as independent claim 22.

Dependent claims 23-24 are further patentable over Purdy in view of Miyashita for additional reasons. The Examiner asserts in paragraph 24 that Purdy discloses a method of cleaning a membrane module disposed in a tank where the liquid level must seal the lower end of the open-ended tube and the seal must be maintained while aerating.

However, the portion of Purdy cited by the Examiner recites:

It is surprising that a relatively small static head of water, with little or no water flow over the membrane, can be sufficient to cause filtered water to pass through the membrane so that the membrane surface can be scoured with air with limited chance of particles which have been carried to the membrane by any water flow blocking the membrane.

This section of Purdy makes no mention of any open-ended tube, let alone a method comprising maintaining a liquid seal on the lower end of a tube while aerating the tube. Thus, the Examiner has provided no reasonable argument for the rejection of dependent claims 23-24.

Accordingly, reconsideration and withdrawal of the rejection of dependent claims 23-26 under 35 U.S.C. § 103 as being unpatentable over Purdy in view of Miyashita is respectfully requested.

New Claims

New dependent claims 35 and 36 are patentable for at least the same reasons as discussed above.

CONCLUSION

In view of the foregoing Amendments and Remarks, this application is in condition for allowance; a notice to this effect is respectfully requested. If the Examiner believes that the application is not in condition for allowance, the Examiner is requested to call Applicant's attorney at the telephone number listed below.

If this Response is not considered timely filed and if a request for an extension of time is otherwise absent, Applicant hereby requests any necessary extension of time. If there is a fee occasioned by this Response, including an extension fee, that is not covered by an enclosed check, please charge any deficiency to Deposit Account No. 50/2762. (Ref. No. M2019-7023US)

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